

Vocational androgogy for law and business logic

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Abstract

The disciplines of business use various epistemological techniques, including systems analysis and design, to produce profit. However, like most disciplines, their use of logic is flexible if not chaotic; it requires analysis and design of a logic system for the strategic use of deduction, induction and abduction to optimize and sustain profit. The complex logic system shell, eGanges was designed for the legal domain, according to a meta-epistemological methodology for the field of artificial intelligence. Law is a major business discipline, although it also stands alone as a discipline in its own right. The legal domain epistemology was found to use a paradigm similar to the Ishikawa fishbone that was originally developed for quality control management. eGanges systematizes the use of logic in a way common for law and business; its computational epistemology is seamless for androgogy and informed, on-the-job decision-making in fields that use complex systems of rules, procedures, policies, strategies and causation.

Keywords: epistemology, expert systems, androgogy, decisionmaking.

Disjunction and informed decision-making

The knowledge of lawyers and business experts may take the form of rules, policies, procedures, strategies, causation, and/or other information. This knowledge is data that can be used in decision-making to optimize profit. To do this, firstly, the choices that are implicit in the relevant knowledge must be streamlined to assist evaluation and selection. Streamlining of alternatives as the decision-making pathways requires a determination of the disjunctions in the knowledge.

Knowledge may be used deductively, inductively or abductively, depending upon the meaning of its premises. Deductive premises are applied with necessary validity; inductive premises have definitional or existential validity; and abductive premises provide strong or weak support for the content of deductive and inductive premises. Two major categories of disjunction occur in each of these three available forms of logic: common consequent disjunction, where

premises share the same consequent, and contradictory disjunction where there are contradictory consequents. When selecting a disjunctive premise for application, its validity as deductive, inductive or abductive, characterises the choice. A decision-making process through the available disjunctions, produces a mix of deductive, inductive and abductive premises with a consequent mix of logical validity.

In a system of complex logic that assists informed decision-making, the extended deductive premises provide the continuity and finality about which inductive and abductive premises may be organised. Continuity provides system flow and finality provides system purpose, two requirements in systems theory and design. This the basic epistemological design of eGanges, which is a user-friendly, complex logic system shell for androgogy, and informed, on-the-job decision-making. It provides the same epistemological system for teaching and vocational tasks, and for various fields of business and law that use complex logic systems of rules, procedures, policies, strategies, causation and/or other information. The androgogy or pedagogy of eGanges seamlessly translates to commercial methodology for decision-making; the eGanges applications for teaching may also be used as job aids.

In addition, eGanges has been designed to suit the pervasive technology of PDAs (personal digital assistants), including suitably equipped mobile phones, as it has click knowledge navigation and click automated extended deduction. Its use of language is minimalistic to make simple the translation of applications for multi-cultural purposes; it uses choice maps, rather than language, for the communication of alternatives, as the basis for common understanding of complex choice systems. The choice maps, which represent the disjunctions of the knowledge as alternate tributaries in a hierarchical River system of extended deductive premises, may be drawn in the Mondrian interface according to artistic principles of cognitive and mnemonic aids; they require only the urban intelligence for reading a street map or suburban transport routes.

Epistemology of eGanges

The computational epistemology of eGanges has two parts: the static and the dynamic.

Static

The static part of eGanges consists of:

- (1) maps of a system of extended deductive premises that have the structure of a tributary system like a river;

- (2) spectra of inductive instances that detail the components of the deductive premises; and
- (3) strata of abductive premises that provide further information that is pertinent to the components of the deductive premises.

The static part of eGanges allows the user to consider how a Final consequent is established by alternative overlapping sets of necessary and sufficient conditions which may be interspersed with unnecessary and insufficient conditions, called neutral nodes in the eGanges epistemology; these sets of requirements are mapped as the alternative pathways from which a decision-making process may select one or more pathways that are available.

Dynamic

The dynamic part of eGanges has three ways of processing the deductive maps:

- (1) free navigation of the maps which may be nested as far as the expertise requires;
- (2) interrogation of the user to elicit the Minor premises of the user's situation for the purpose of automated extended deduction;
- (3) decision-making according to the extended deduction permitted by the Major premises of the maps and the user's Minor premises.

The dynamic part of eGanges implements the user's selection from the alternative overlapping sets of necessary and sufficient conditions that establish a Final consequent; these pathways selected in the decision-making process are shown cumulatively and may be monitored in terms of the Final result that will be reached, given each selection.

Demonstration eGanges applet

For full appreciation of the epistemology, the dynamics of eGanges can be seen by running the sample corporate/finance law applet that has the Final result of Financial market; this is currently available on the Grays Knowledge Engineering website at:

www.grayske.com/FinLawTrial/index.html

This demonstration applet has River maps of the deductive definitional rules of financial market in the Australian Corporations Act. It can be consulted by a user who does not have a copy of the eGanges shell installed on the computer used, but does have Java software available. The applet was used in 2006 in online teaching of Finance Law students at Charles Sturt University. Not only do students learn the definition, they also learn how to think about

the definition. The applet contains inductive spectra and abductive glosses that provide an elaboration of points on the River.

In constructing the applet, it was necessary to identify the implied choice points in order to determine the deductive links that would give effect to the compressed disjunction in the definition. Choice can be made apparent through its logic structures, although natural language descriptions might compress the alternatives of complex disjunction so that they are not clearly seen.

Sample eGanges applications

Inter alia, specific business applications of the eGanges software may be designed for various tasks in the law and business domains that involve complex informed decision-making: there may be applications for the training or guidance of employees, and at the same time for the management of employment contracts; the strategic negotiation of agreements; quality control of operations, transactions and policies; the avoidance or resolution of conflict; and compliance planning. Understanding of complex logic, complex choice and complex transactions in a user-friendly, transparent way, can be facilitated by appropriate management applications. The eGanges epistemology is illustrated by the following law and business examples:

Training and guidance of employees

In the application, *Julian's Bakery job*, a bakery retail assistant's job is mapped as vocational procedure for training and on-the-job advice; the Initial map of the application is shown in **Figure 1**, in the Rivers window of the eGanges interface. The mainstream of the River lists the tasks to be completed in order to reach the Final result of completing the shift, namely: Shop opening, Shift trading and Shift closing. Each task is detailed by secondary streams and sometimes details on a secondary stream are further particularized by tertiary streams, and so on. Sometimes there are choices, such as those in **Figure 2** which is a submap of 'Shop opening complete'; this contains a fan of two alternative ways of getting the door unlocked. A node that is patterned like a soccer ball indicates a submap; it is called a soccerball node.

Usually, a shop assistant would be instructed *ad hoc* in the job by the shop manager, as the day progresses. Over a period of time, as the shop assistant performs according to instructions, questions might be asked to clarify tasks, depending on the shop assistant's perception of the work environment politics. If the shop assistant had an insight to improve the instruction, the performance of the job or the enterprise, the benefit of this insight might not

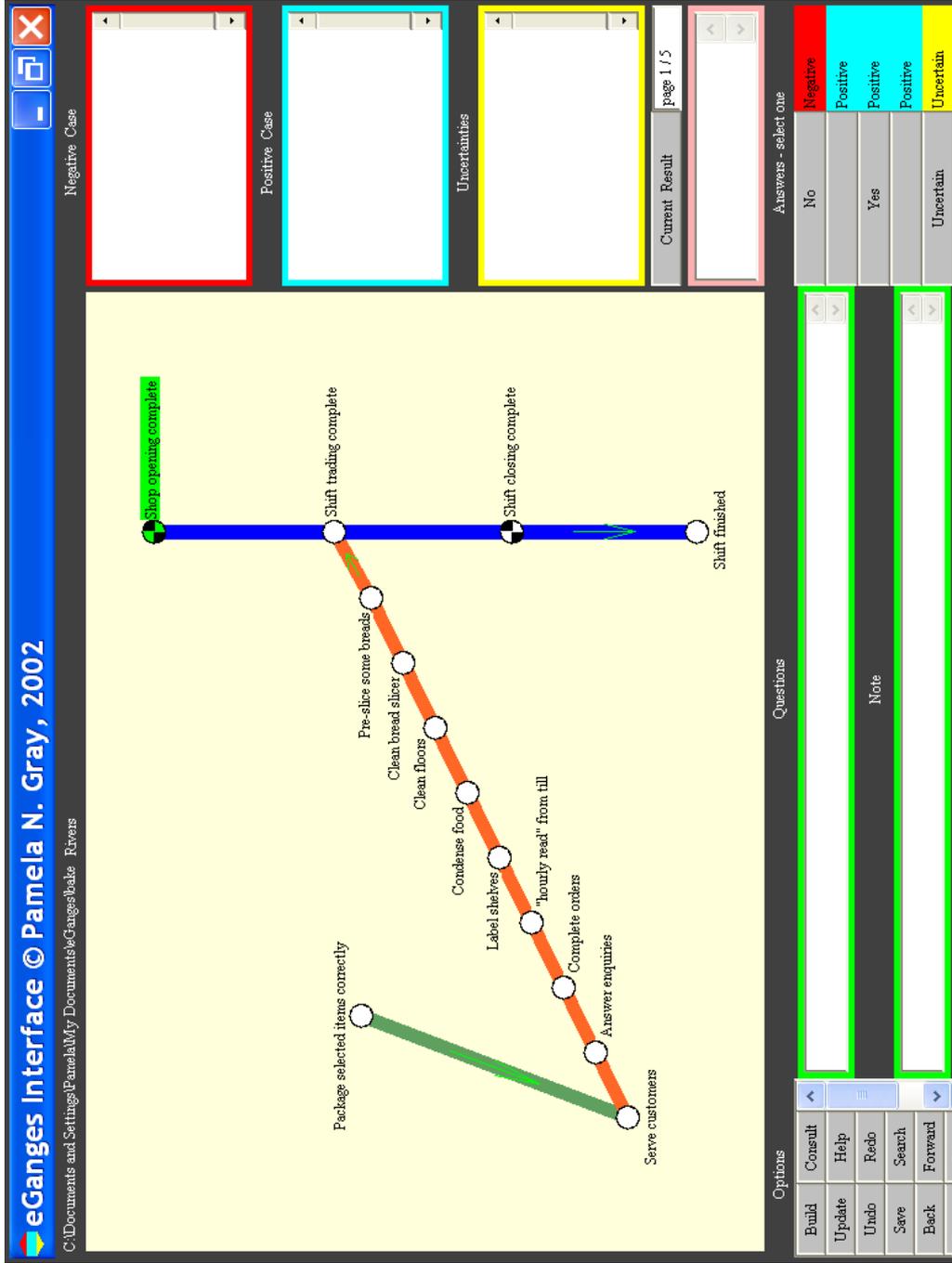


Figure 1: Initial map: Julian's Bakery job in eGanges interface
 © Pamela N. Gray. Xenogene Gray and Lyn M. Treanor. 2006

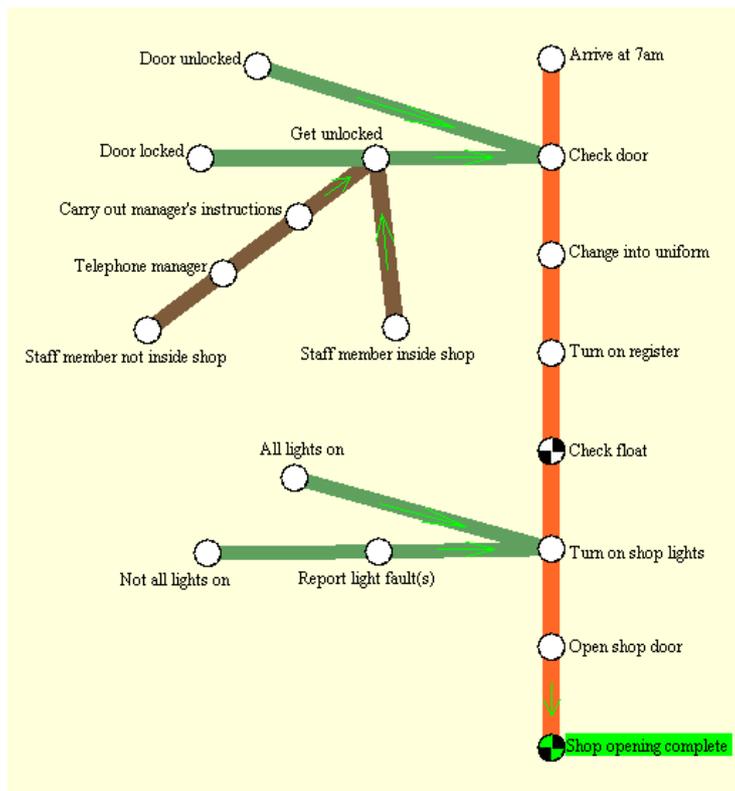


Figure 2: Julian's Bakery job eGanges submap of Shop opening complete
 © Pamela N. Gray, Xenogene Gray and Lyn M. Treanor, 2006

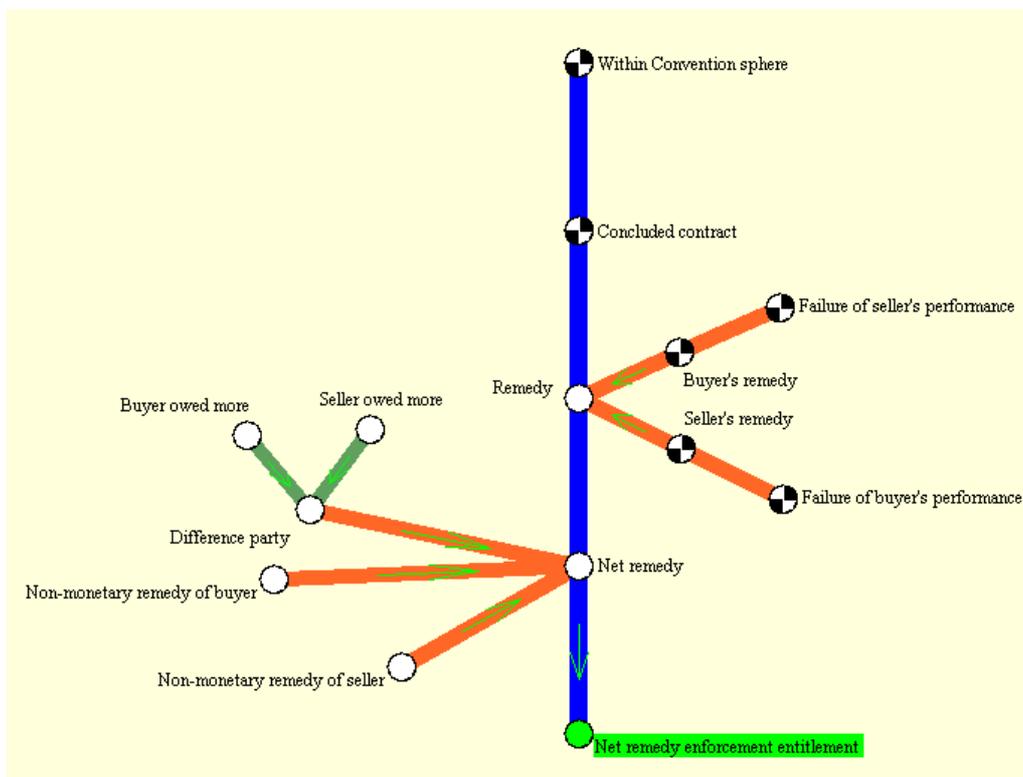


Figure 3: eGanges Initial map: Vienna Convention
 © Pamela N. Gray, 2003

emerge, depending on the workplace relations that had been established at the time of the insight. Adopted roles might be set and followed without question. The paradigm shift away from this practice to eGanges, would see training in advance through the eGanges application, with opportunities for the trainee to resort to the application for clarification during the job, and to input questions or comments through the Notes window for the manager to see.

A small task map might be used to carry out that task; it can also act as a quality control record to ensure that the task is properly carried out, or to give authority for the task to be carried out in that way. Rather than working in the context of fuzzy reality and unspecified experience, there would be explicit understanding of large-scale complexity. There would be the communication required for exact quality control and precise understanding of jobs. As science and technology permeate work, this may be crucial to the workplace and the use of work tools. eGanges may permit more effective training that gives greater flexibility and benefit to management; it may be possible to increase the number of skilled and semi-skilled workers from the population of unskilled workers.

Job maps can indicate the complexity of a job and the points at which alternative ways of carrying out the job are available. It is possible for eGanges applications to run on mobile phones that have Java and sufficient memory, so that they can be made available for performance of jobs at various or moving locations, like a telephone; eGanges (about 250 kB) and its applications are memory lean. A manager could build an application while waiting at an airport or station and email it to an employee.

Strategic negotiation of agreements

In the negotiation of international trade contracts, a map of the Vienna Convention can be used to ensure that strategic choices are made and the requirements for a valid contract are met (cf. Gray, 1988). **Figure 3** is the initial map that shows the soccer ball node, Concluded contract, for further exploration. Bespoke negotiation applications could be developed to incorporate or limit the information required for a specific business or specific transaction(s).

Quality control of operations

Control of operations might require management of definitions or something on a larger scale. **Figure 4** is a model map of how metamorphic change might be managed. The areas of change such as technology, and environmental, social and economic sustainability, must be managed in association with the areas that are being changed. This is a logic of becoming; homeostasis is maintained in synergy with heterostasis. The node 'Base' might include the model map itself, giving effect to a fractal nature in the system that has been seen to ensure

its perpetuation (Bolzano, c.1848, 1950, Bronowski, 1977, Cocks, 2003). The Quality control of management itself can be effected through appropriate eGanges applications.

Compliance planning

The requirements of law may be included as part of a business application, or an application may be wholly legal and available for business consultations. Where there is relevant information on a website such as a list of protected wildlife species on a government website, an abductive link could be made available from an environmental compliance application to that website.

Avoidance or resolution of conflict

eGanges maps may also assist the prevention or resolution of conflict.

Figure 5 shows the chaos of logic structures when all the soccerball nodes are undone in a well developed application of the Australian Spam Act 2003, that has many levels of submapping. This indicates how difficult it is to prevent or resolve conflict when negotiation occurs in the fuzzy reality of spaghetti logic.

Paradigm shift in human intelligence

It is easy to learn and use eGanges, both in the construction and in the consultation of an application. In a user-friendly, transparent way, eGanges gives access to the necessary logic of deduction, the ontological logic of induction, and the variable support of abduction. The user's situation may be processed for fast solutions or careful consideration.

However, like a book, an application is only as good as the author. The builder of an application must have sufficient expertise to sort deductive, inductive and abductive information, and order the information for the interactive visualization of the River, so that its deductive processing is substantively correct. An application may be detailed as far as the information goes, with DIAlectic (Deduction Induction Abduction) precision.

The disciplines of business, including law, use various epistemological techniques to produce profit. Like most disciplines, their use of logic is flexible, if not chaotic; sophists posing as the spin doctors of public relations, corrupt intelligent business for an inevitable demise. With logic aids the three forms of logic, deduction, induction and abduction, may be managed systematically or strategically to optimize profit, without the risks of sophisticated manipulation.

The prior analytics required for eGanges applications that may speed up and expand the teaching and communication of complex natural language information, are the province of academia and private Research and Development; these applications, if appropriately drawn, may speed up and make less stressful, the complex decisionmaking processes in the jobs of law and business. A common epistemology for androgogy and vocational decisionmaking, rationalizes intelligent resources. The formalized DIAlectic of eGanges is suitable for teaching as well as business negotiations, meetings, transactions, operations, policies, planning, training etc. Teaching of vocational applications and the prior analytics required for construction of workplace applications, both provide job skills.

eGanges Rivers are ideographs that can convey and manage complex large-scale information about requirements and choice in order to reach a specified objective, goal or target. Rivers, which are like the enhanced, nested Ishikawa diagrams used in quality control (Ishikawa, 1985; Morgan, 2002), are logic guides through the dense information forest in which contemporary business must be conducted, where it is easy to get lost in the taxonomy and decision trees. The flow of an application River, indicated by the inference arrows, ensures that the direction of reasoning is always toward the end result.

For a fast changing world, applications of eGanges are set in chips not stone; they are flexible for quick and easy adaptation and change. It is the phenomenon of double disjunction in expert knowledge that produces the alternative possible paths of a complex decision-making system. A clear understanding of this phenomenon, the available pathways, and the scheme of logic, not only expedites decision-making and reduces the stress of working with chaotic and incomplete information, it also permits precise evaluation of the whole system. Available pathways may be adjusted for comprehensive improvement no matter how extensive or complex. Through a paradigm shift in human intelligence (cf. Kuhn, 1962, 1970), to a common stable and reliable ideographic epistemology (Fraunce, 1588; Gray, 2005), intricate information may be adjusted with scientific precision for minor or massive adaptation and change; electronic epistemological aids allow refined management.

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